Trig Final (Solution v17)
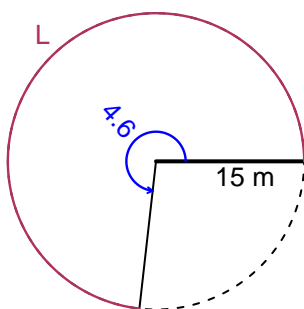
- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 15 meters. The angle measure is 4.6 radians. How long is the arc in meters?
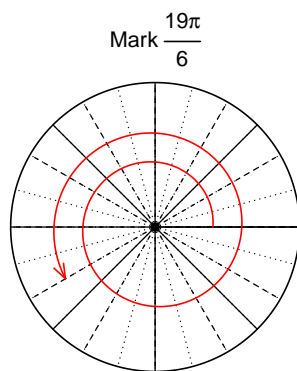
$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$
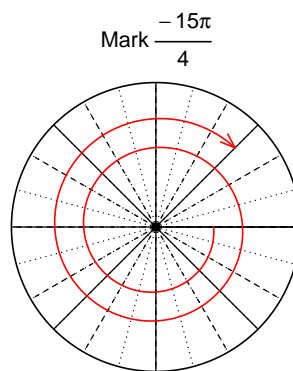
$L = 69$ meters.

Question 2

Consider angles $\frac{19\pi}{6}$ and $\frac{-15\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{19\pi}{6}\right)$ and $\cos\left(\frac{-15\pi}{4}\right)$ by using a unit circle (provided separately).

Mark $\dfrac{19\pi}{6}$

Mark $\dfrac{-15\pi}{4}$

Find sin(19π/6)

Find cos(−15π/4)

$\sin(19\pi/6)= \frac{-1}{2}$
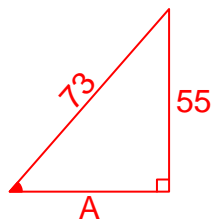
$\cos(-15\pi/4)= \frac{\sqrt{2}}{2}$

Question 3

If $\sin(\theta) = \frac{-55}{73}$, and θ is in quadrant III, determine an exact value for $\cos(\theta)$.
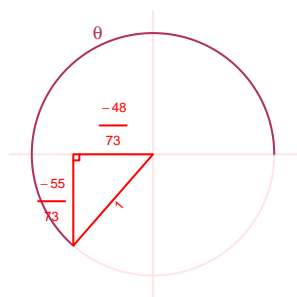
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.

Solve the Pythagorean Equation

$$A^2 + 55^2 = 73^2$$
$$A = \sqrt{73^2 - 55^2}$$
$$A = 48$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.

$$\cos(\theta) = \frac{-48}{73}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 8.06 Hz, a midline at $y = -5.71$ meters, and an amplitude of 4.4 meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -4.4\sin(2\pi 8.06t) - 5.71$$

or

$$y = -4.4\sin(16.12\pi t) - 5.71$$

or

$$y = -4.4\sin(50.64t) - 5.71$$